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DEVICE FOR MOUNTING OR FOR EXCHANGING THE PRINTING CYLINDER CASINGS OF A PRINTING CYLINDER

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The invention pertains to a device for mounting or for exchanging the printing cylinder casings (sleeves) of a printing cylinder (plate cylinder) of a roller-type rotary printing machine, preferably a flexographic printing machine, comprising a mounting frame in which one end of the printing cylinder can be clamped.

In order to exchange the printing plates or plates of a printing cylinder, it is known that the printing cylinders can be provided with exchangeable printing cylinder casings that are sheath-shaped or that have the shape of a tubular section and whose outer sides form the plate. In order to facilitate the procedure for pushing the printing cylinder casings onto the printing cylinder from one side, it is known that the printing cylinder can be constructed in a slightly conical fashion and that the printing cylinder casing can be constructed in a correspondingly complementary manner, wherein, in order to expand the printing cylinder casing, holes for compressed air open out in the casing surface of the printing cylinder and can be impinged by compressed air during installation of the printing cylinder casing.

In order to be able to pull off a printing cylinder casing (also termed a sleeve) from the printing cylinder, or to be able to push it onto the printing cylinder, it is known that a shaft journal of the printing cylinder is to be supported on a supporting trestle and that a tube is to be pushed onto the other shaft journal for the purpose of lengthening it, so to speak, whereby this tube is likewise supported at its outer end on a supporting trestle and, in order to pull off the printing cylinder casing, this casing is pulled onto the tube and can then be removed from it after supporting the printing cylinder temporarily on a trestle that has been inserted at the shaft journal that is carrying the tube. In order to push on a printing cylinder casing, one then proceeds in the correspondingly reversed manner. This known method of exchanging the printing cylinder casing via a supporting tube that lengthens a shaft journal is laborious. It is for this reason that attempts have already been made in practice to clamp a printing cylinder at one of its ends, namely via its shaft journal, in a mounting frame of the type indicated at the beginning in such a way that the printing cylinder is held therein in a freely and outwardly projecting manner so that the procedure for pulling off and pushing on printing cylinder casings is possible without special supporting devices. However, it has been shown, especially in the case of relatively large plate cylinders, that permanent bowing occurs at the clamped journal of the plate cylinder as a consequence of the great weight.

A mounting frame in Figures 1–3 below has been described in which a plate cylinder can be clamped with one end freely and outwardly projecting, with no fear of warped regions or damaged regions of the plate cylinder or a shaft journal. In order to permit such damage-free clamping, coupling elements are or can be connected to a front side of the printing cylinder at a certain radial separation from its shaft journal, the coupling elements being capable of coupling with counter-coupling elements of the mounting frame, so that the printing cylinder can be held

in a freely floating manner in the mounting frame. The coupling elements that are or can be connected to a front side of the printing cylinder grip it at a relatively large vertical separation from the center line so that the reaction force couple does not exceed a permissible magnitude. The forces are hereby passed on directly to the printing cylinder, which is capable of handling these stresses without fear of damaged regions or deformed regions.

After the plate cylinder casing has been pushed onto the plate cylinder in the device that is described on the basis of Figures 1–3 and fixed in this device, adapters that determine the axial position of the plate cylinder in the printing machine are pushed onto the free shaft journals 6 and 29 sufficiently far that these fit into the inner rings of the bearings 8 in a flush manner. The adapters are then bolted onto the inner journals 6 and 29. The plate cylinder 7 that has been prepared in this way is then inserted into a printing machine, wherein alignment forks, which serve for exact alignment purposes, enter from below in order to set up the axial position of the plate cylinder in the adapters that have been installed. It has now been found in practice that, on the one hand, fitting inaccuracies cannot be avoided at the time of the manufacture of the adapters and that, on the other hand, further inaccuracies can occur as a result of the installation of the adapters on the journals 6 and 29 because the bearings 8, which determine the axial position of the adapters, do not always exhibit the same accurately defined separation from the corresponding front side of the plate cylinder 7. When inserting the plate cylinder in a printing unit and setting up its axial positions, the situation consequently arises that one or both adapters have to be loosened and displaced on the shaft journal in such a way that the alignment forks can arrive, from below, in the annular grooves in the adapters, which grooves serve for position determination purposes. The situation can arise from this type of set-up procedure in which a plate cylinder is inserted into the printing unit while displaced in the axial direction so that in the case of printing with, for example, six inking units in a printing machine, the individual plate cylinders can be positioned in a slightly axially displaced manner relative to one another. As a result of this axial displacement, a blurred printing result arises that cannot be accepted in light of the increasing demands in regard to print quality.

The problem for the invention is therefore to create a device of the type that is indicated at the beginning, with which adapters can be pushed onto and attached to the shaft journals of the plate cylinder while these adapters fit exactly and determine the axial position of the plate cylinder in the printing unit.

In accordance with the invention, this problem is solved in the case of a device of this general type in that guidance pieces are arranged that exhibit a prescribed fixed separation from one another in the mounting frame, namely in a manner that permits displacement parallel to the axis of the plate cylinder, with alignment forks positioned on the guidance pieces perpendicularly to the axis of the plate cylinder in a manner in which they can be pushed out or drawn in, and

with these alignment forks capable of being driven into the annular grooves by bush-like adapters, which are arranged and fixed on the shaft journals of the plate cylinder in a manner that permits their axial displacement, and in that an alignment element, which exhibits a prescribed fixed separation from the alignment forks, can be displaced via the guidance pieces, with the directional beam of the alignment element being adjustable, as a result of displacing the guidance pieces, relative to a register mark that has been applied to the sleeve. After the plate cylinder casing has in this way been attached to the plate cylinder, the guidance pieces are displaced parallel to the axis of the plate cylinder in such a way that the directional beam of the alignment element accurately strikes the register mark, which serves for alignment purposes, or another mark on the printing cylinder casing. Once this adjustment has been carried out, the adapters or their annular grooves are also found to be located at the correct axial separation from the casing of the plate cylinder as a result of the calibration of the device so that these can then be fixed to the shaft journals in a known way.

Errors in terms of register during printing can also arise in that a drive gear wheel has not been attached to the shaft journal at the correct angle relative to the plate cylinder casing. In an additional embodiment of the invention, the feature is therefore provided that an adapter supports a drive gear wheel of the plate cylinder, with this gear wheel being rotatable relative to this adapter or the shaft journal and capable of being fixed thereon, and that a tooth or tooth segment, that can be pushed out or pushed in, is positioned on the guidance piece that is assigned to this adapter and at a prescribed defined axial separation from the alignment fork thereon that is adjustable in terms of height. Since this tooth or tooth segment has also been aligned in a positionally correct manner relative to the printing cylinder casing as a result of the adjustment of the directional beam of the alignment element onto the register mark, this tooth segment can be brought into engagement with the drive gear wheel as a result of pushing out, so that this tooth segment is also aligned in an angularly correct manner relative to the plate cylinder casing and can be fixed to the adapter or to the shaft journal.

In a further embodiment of the invention, the feature is provided that the guidance pieces and the supporting piece of the alignment element are attached to a communal rod or to a communal support, wherein the guidance pieces or the supporting piece are/is led into guides or drilled holes of corbels that are attached to the base frame or the mounting frame. The guidance rod and the supporting pieces and guidance pieces that are attached thereto are expediently capable of being adjusted via an adjustment device, e.g. a spindle pinion gear, in the axial direction of the guidance rod. The guidance pieces and the supporting piece can comprise sliding carriages that can be displaced in guides on the base plate or the mounting frame.

An embodiment example of the invention will be elucidated below by means of the drawings. The following are shown therein:

Figure 1, a lateral view of the plate cylinder installation device with a partially cut away supporting trestle with coupling elements;

Figure 2, a view in the direction of the arrow A of the coupling housing of the supporting trestle illustrated in sectional form in Figure 1;

Figure 3, a plan view of the coupling housing in accordance with Figure 2, wherein the upper component thereof, which is capable of swiveling, has been omitted to achieve a better overview; and

Figure 4, a device of the type that is described in Figures 1–3, wherein this device has been provided with contrivances for the alignment of the adapters, which can be pushed onto the shaft journals and of being fixed thereon, and the drive gear wheel.

The rack 1, which can be seen from Figure 1, has a piston/cylinder unit 3 on its left side, whose cylinder 2 is firmly attached to the base frame or the base plate of the mounting frame 1. The piston 4 of this piston/cylinder unit has a corbel 5 at its end that is located opposite the cylinder 2, upon which corbel the journal 6 of the plate cylinder 7 rests via a bearing 8. A strengthening ring 9 is firmly connected to the front wall 10 of the plate cylinder 7, namely at the end of the plate cylinder 7 that is located opposite the journal 6. The strengthening ring 9 has a peripheral groove 11 into which the front walls 12 and 13 of a housing 14 engage, as a result of which the plate cylinder 7 is held. The housing 14 is firmly connected to the rack 1. The housing comprises a lower base plate 15 with two side walls 16 and 17. A front wall 12 is firmly connected to the two side walls 16 and 17 and also to the base plate 15, it is offset, and it has a circular arc-shaped recess 18. Two supporting rollers 19 and 20 are connected in a rotatable manner to the front wall 12 in the region of this recess 18. A lid 22 is connected via a hinge 21 to this lower component that has been constructed in this way, and comprises the front wall 13 as well as an upper cover plate 23 connected to it and two side walls 24. Stanchions 25 are welded to the lid 22 and to the front wall 13 for the purpose of strengthening the lid 22. Just as in the case of the front wall 12 of the lower component, the front wall 13 has a circular arc-shaped recess 26 that has a collar-shaped hollowed-out region 27.

The plate cylinder 7 illustrated in Figure 1 is consequently inserted from above into the housing 14 that has been swung open, wherein the recess 18 is positioned in the peripheral groove 11 of the strengthening ring 9. The outer projecting edge 28 of the strengthening ring 9 is hereby supported on the supporting rollers 19 and 20. As soon as this has happened, the lid 22 is swiveled out of the position illustrated via the full lines in Figure 2 and into the position illustrated via the dashed and dotted lines in Figure 2 in such a way that the recess 26 is positioned from above in the peripheral groove 11, wherein the collar-shaped hollowed-out region 27 lies adjacent to the outwardly projecting edge 28 of the strengthening ring 9. As soon as this has happened and the lid 22 has been bolted to the lower component in a way that has not

been illustrated in further detail, the plate cylinder is first rotated into the desired position, after which the piston rod 4 is driven downward. The plate cylinder 7 is thus mounted in a one-ended manner, as a result of which the installation of a sleeve from the free side is readily possible. The forces that are required for supporting the plate cylinder 7 are not passed onto the journal 29 but rather to the front wall 10 of the plate cylinder 7 via the strengthening ring 9. It is for this reason that deformations of the journal 29 are not to be feared. In order to fully ensure this, the strengthening ring 9 has a continuous bored-out hole 30 that is slightly larger than the external diameter of the journal 29.

The device in accordance with the invention that corresponds, in terms of its basic assembly, to the device that has been described on the basis of Figures 1–3 will now be elucidated in greater detail with reference to Figure 4.

Two corbels 102 and 103, which are positioned at a certain separation from one another, are welded to the base frame 101. The two corbels 102 and 103 are connected to one another via a connecting rod 104, wherein the connecting rod 104 can be displaced axially. Three sliding carriages 105, 106 and 107, which rest on the base frame 101 in a sliding manner, are firmly connected to the connecting rod 104. The sliding carriage 106 has a threaded hole, which is not illustrated in greater detail, into which a threaded spindle 108 engages. This threaded spindle 108 is rotatable via the part 109 thereof, which is free from threads although it is mounted in the corbel 102 in a manner that permits axial displacement, wherein a handwheel 110 has been installed on the end 109 that is free from threads and that projects outward. As a result of turning this handwheel 110, the sliding carriage 106 can now be moved back and forth in the direction of the arrow A, as a result of which the sliding carriages 105 and 108 [sic; 107] can, likewise, simultaneously be displaced via the connecting rod 104 to the same extent as the sliding carriage 106. Whereas the sliding carriage 108 supports an upward-directed light source 111, which transmits a directional beam, profiled iron elements 112 and 113 are firmly connected to the sliding carriages 105 and 106, with these profiled iron elements being respectively surrounded by a U-shaped guidance device 114 or 115. The U-shaped guidance devices 114 and 115 respectively support alignment forks 116 and 117 and can be repositioned in terms of their height and locked in position on the profiled iron elements 112 and 113.

In addition to the U-shaped guidance device 115, the profiled iron element 112, which is connected to the sliding carriage 106, is also partially surrounded by a second guidance element 118 that supports a tooth segment 120 via a retainer 119. This tooth segment can be repositioned in terms of height at the profiled iron element 112 by displacing the U-shaped guidance device 118.

In the embodiment example that is illustrated, an adapter 125, which has been provided with an annular groove 122, has been pushed onto the journal 121, whereas an adapter 125,

which has an annular groove 126, has been pushed onto the journal 124. In addition, the adapter 125 supports the drive gear wheel 127. The adapter 125 has a serrated region that engages with the serrated region of the journal 124 so that drive forces can be transferred.

If a plate cylinder 128 is now inserted into the device for preparation purposes, then a sleeve, which is not illustrated, is pushed onto the plate cylinder 128 while the plate cylinder 128 is clamped in a one-ended manner by the housing 129, and the corbel 130 is located in its lowered position. After this, the corbel 130 is raised so that it supports the needle bearing 131. The needle bearing 132 on the right side is supported on the corbel 133 that is provided in the housing 129. The lid of the housing 129 is now raised sufficiently far that the plate cylinder 128 can be rotated via the sleeve that has been pulled on. After this, the sliding carriages 105, 106 and 107 are displaced sufficiently far in the direction of the arrow A by means of the handwheel 110, and the plate cylinder 128 is rotated sufficiently far, that the light source 111 is directed accurately onto the register mark that has been printed on each sleeve. After this, the lid of the housing 129 is closed so that the plate cylinder 128 is now positionally fixed in the base frame. Subsequently, the alignment forks 116 and 117 are raised and the adapters 123 and 125 are likewise displaced sufficiently far axially that the alignment forks 116 and 117 can become inserted in the grooves 122 and 126. Subsequently, the adapters are locked in position on the journals 121 and 124 via clamping rings 134 and 135. As a result of this procedure, the situation is ensured that each adapter 123 and 125 is accurately aligned in the axial direction relative to the sleeve or to the register mark that is printed on the sleeve.

After this has happened, the tooth segment 120 is raised and the gear wheel 127 is rotated sufficiently far that it engages tooth-wise with the tooth segment 120. After this, the gear wheel 127 is bolted to the adapter 125 in a way that is not illustrated. As a result of this, the situation is ensured in which the gear wheel 127 or the teeth of the gear wheel 127 is/are aligned completely accurately relative to the register mark of the sleeve when considered in the peripheral direction. Following this alignment work, the alignment forks 116 and 117 and also the tooth segment 120 are lowered, after which the plate cylinder 128 can be taken out after detaching the lid of the housing 129, and then an additional plate cylinder, which is to be aligned, can be inserted in the device. The alignment process itself proceeds analogously.

As a result of the device in accordance with the invention and that has been described above for aligning a plate cylinder, the situation is ensured that the plate cylinders of all the printing units of a printing machine are aligned relative to one another both in the axial direction and also in the peripheral direction. As a result of this, printing is ensured that is, in essence, absolutely accurately in register.

Claims

1. Device for mounting or for exchanging plate cylinder casings (sleeves) of a plate cylinder of a roller type rotary printing machine, preferably a flexographic printing machine, comprising a mounting frame (101) in which one end of the printing cylinder (128) can be clamped,

characterized by the feature

that guidance pieces (105, 106), which exhibit a prescribed fixed separation from one another, are arranged in the mounting frame (101) in a manner that permits displacement parallel to the axis of the plate cylinder (128), wherein alignment forks (116, 117) are positioned on these guidance pieces perpendicularly to the axis of the plate cylinder (128) in a manner that permits their being pushed out or drawn in, and wherein these alignment forks can be driven into the annular grooves (22, 26) by bush-like adapters (123, 125), which are arranged and fixed on the shaft journals (121, 124) of the plate cylinder (128) in a manner that permits their axial displacement, and that an alignment element (111), which exhibits a prescribed fixed separation from the alignment forks (116, 117), can be displaced via the guidance pieces (105, 106), with the directional beam of the alignment element being adjustable, as a result of displacing the guidance pieces (105, 106), onto a register mark that has been applied to the plate cylinder casing

2. Device in accordance with Claim 1, characterized by the feature that an adapter (125) supports a drive gear wheel (127) of the plate cylinder (128), wherein this gear wheel is rotatable relative to this adapter or to the shaft journal (124) and can be fixed thereon, and that a tooth or tooth segment (120), which can be pushed out or pushed in, is positioned on the guidance piece (106) that is assigned to this adapter (125) and at a prescribed defined axial separation from the alignment fork (117) thereon that is adjustable in terms of height.

3. Device in accordance with Claim 1 or 2, characterized by the feature that the guidance pieces (105, 106) and the supporting piece (107) of the alignment element (111) are attached to a communal rod (104) or to a communal support, wherein the guidance pieces or the supporting piece are/is led into guides or drilled holes of corbels (102, 103) that are attached to the base frame or to the mounting frame (101).

4. Device in accordance with one of Claims 1–3, characterized by the feature that the guidance rod (104) and the supporting and guidance pieces (105, 106, 107) that are attached thereto can be adjusted via an adjustment device (108, 109, 110), e.g. a spindle pinion gear, in the axial direction of the guidance rod (104).

5. Device in accordance with one of Claims 1–4, characterized by the feature that the guidance pieces (105, 106) and the supporting piece (107) comprise sliding carriages that can be displaced in guides on the base plate or the mounting frame (101).

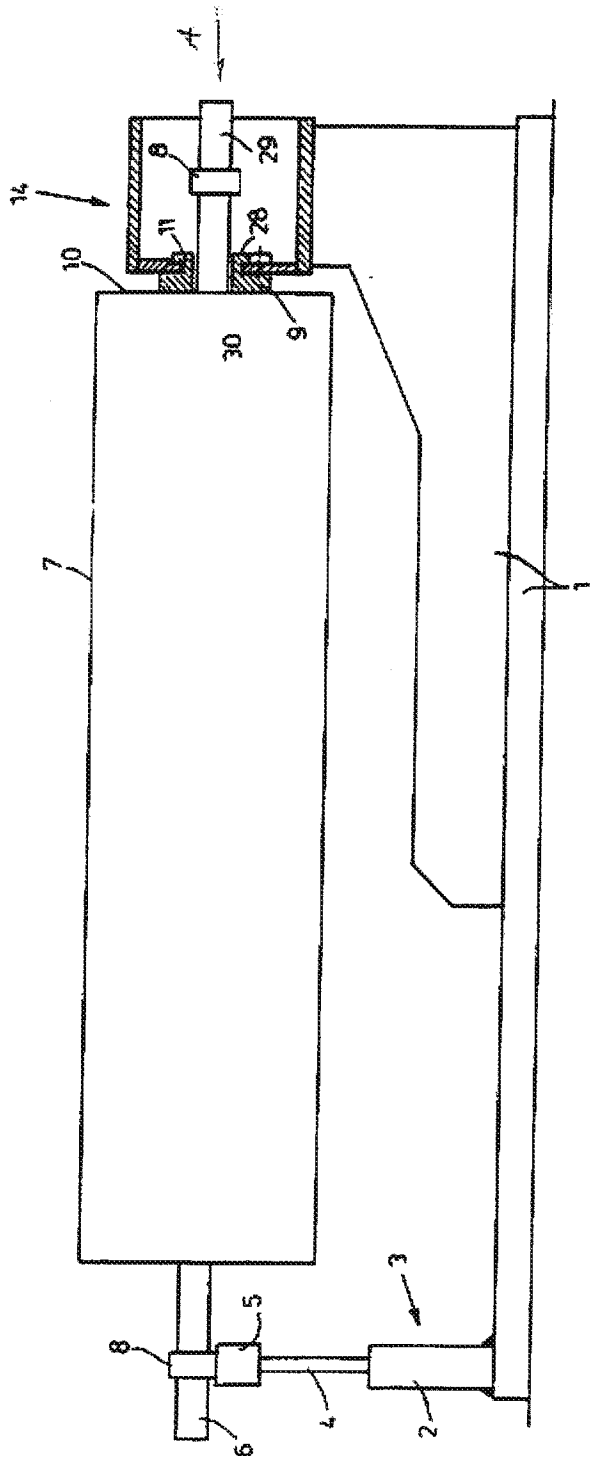

Figure 1

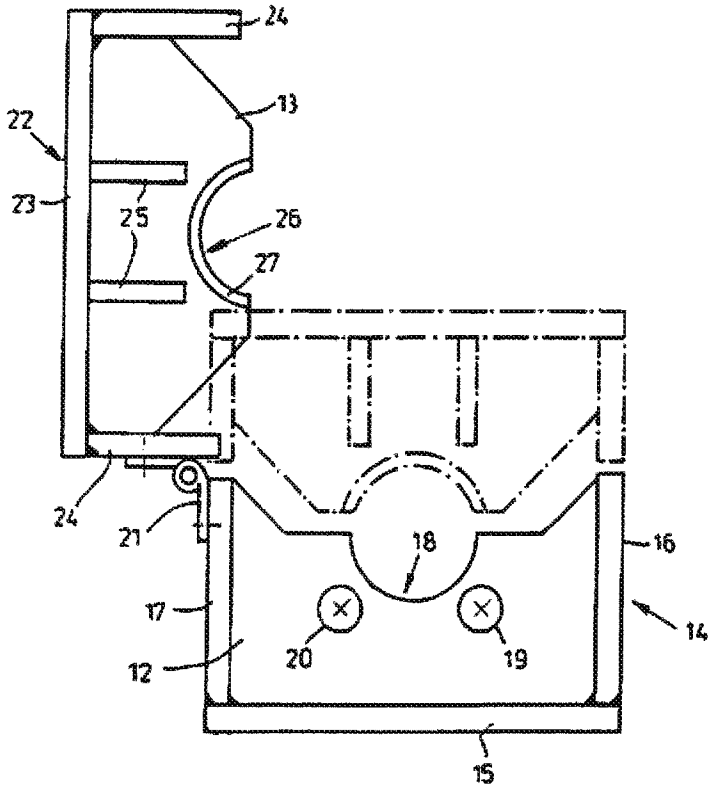

Figure 2

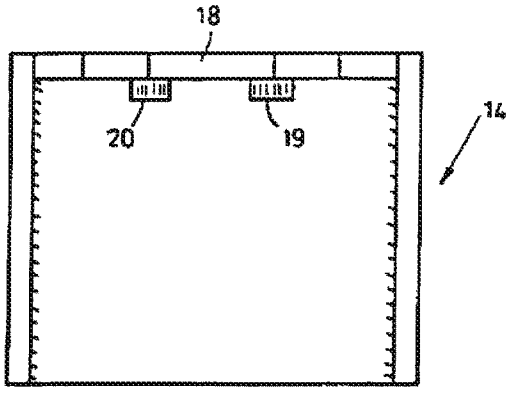

Figure 3

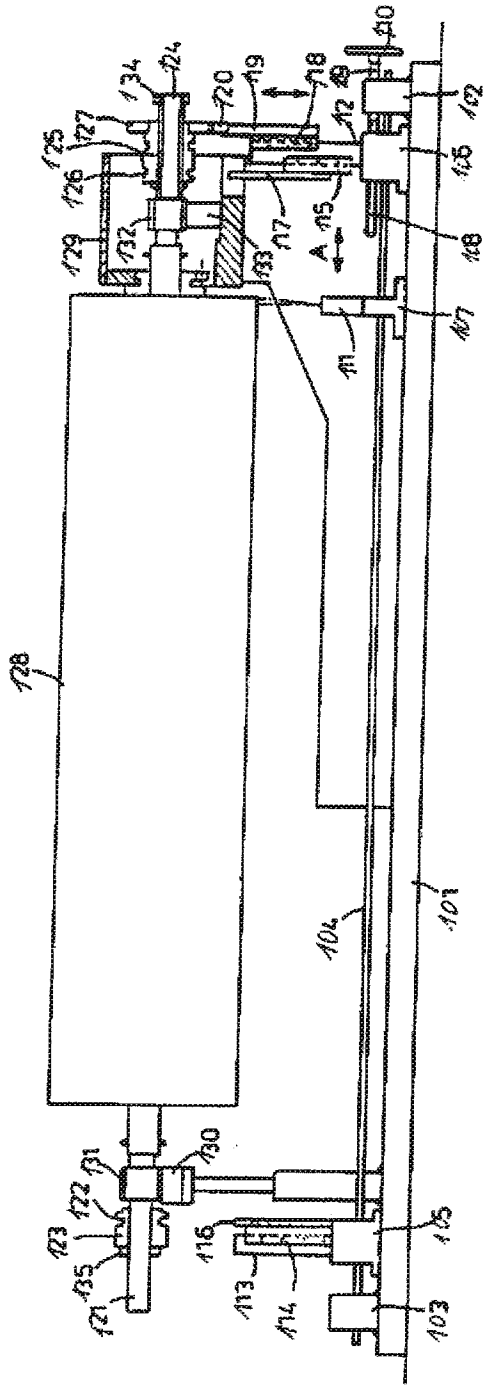
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Figure 4